

2877 B

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Bennett, S.

Serial No: 09/998,944

Filed: October 31, 2001

For: *Angle Random Walk (ARW) Noise  
Reduction in Fiber Optic Sensors Using an  
Optical Amplifier*

Examiner: Turner, Samuel A.

Art Unit: 2877

Attorney Docket No. KVC-051.01

**CERTIFICATE OF HAND DELIVER**

I hereby certify that this Information Disclosure Statement is being submitted by hand delivery to Examiner Samuel A. Turner, U.S. Patent and Trademark Office, Technology Center 2800, Crystal Mall 1, 7<sup>th</sup> Floor, 1911 S. Clark Place, Arlington, VA 22202 on the date set forth below.

June, 2004  
Date of Signature and Hand Delivery

By: \_\_\_\_\_  
Name:

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**SUBMISSION OF DUPLICATE  
SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT**

Sir:

Enclosed please find a copy of correspondence that was mailed to the USPTO on October 10, 2003. Included in that mailing were:

- 1) Response under 37 CFR 1.111
- 2) Supplementary IDS with Certificate of First Class Mailing dated October 10, 2003;
- 3) PTO Form 1449 listing references AAA-FV;
- 4) Copy of listed references AAA-FV;
- 5) Formal Drawings;
- 6) Check in the sum of \$180.00 for IDS submission; and
- 7) A return postcard.

A copy of items 2-3, and a copy of item 4, references EA-EO and FA-FV are enclosed. A copy of the return postcard with OIPE postmark of October 14, 2003, is also enclosed.

According to the Office Communication dated May 10, 2004, and a telephonic communication on May 27, 2004 with the Examiner, the Examiner indicated that the copy of listed references had not been received.

We respectfully request that this duplicate IDS, which includes a duplicate copy of the references not considered by the Examiner, be matched with the file and forwarded to the Examiner for consideration under 37 CFR 1.97 (b).

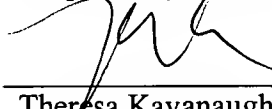
No additional costs are believed to be due in connection with this duplicate submission. If, however, there are costs associated with this submission, please charge the appropriate fee to our **Deposit Order Account No. 06-1448**.

Should there be any questions after reviewing this duplicate submission, the Examiner is invited to contact the undersigned at (617) 832-1000.

Date: May 28, 2004

**Customer No: 25181**  
Patent Group  
Foley Hoag, LLP  
155 Seaport Boulevard  
Boston, MA 02109-2170

Respectfully Submitted,



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Theresa Kavanaugh  
Reg. No. 50,356  
Agent for Applicants



COPY

Application No.: 09/998,944

Atty Docket No.: KVC-051.01

Applicant(s): Bennett, S.

Filed: October 31, 2003

Title: *Angle Random Walk (ARW) Noise Reduction in Fiber Optic Sensors Using an Optical Amplifier*

The following was/were received in the U.S. Patent & Trademark Office Mail Room on the date stamped hereon:

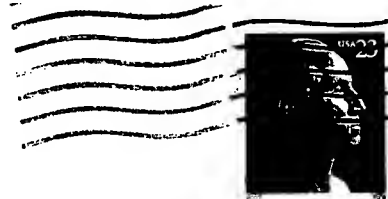
1. Response Under 37 CFR §1.111 (13 pages);
2. Supplemental Information Disclosure Statement Under 37 CFR § 1.97 (c)(2) (2 pages);
3. Form PTO-1449 (6 pages);
4. Complete copies of Cited References AAA-FV (126 Refs.);
5. Formal Drawings, Figures 1-5 (3 sheets)
6. Check in the sum of \$180.00; and
7. This Return Postcard.

RECEIVED

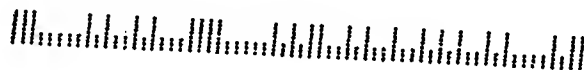


Atty: TCK

Mailing Date: October 10, 2003



PATENT GROUP  
FOLEY HOAG LLP  
155 SEAPORT BOULEVARD  
BOSTON, MASSACHUSETTS 02210-2600





THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Bennett, S.

Application No: 09/998,944

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For: *Angle Random Walk (ARW) Noise  
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Examiner: Turner, Samuel A.

Art Unit: 2877

Attorney Docket No. KVC-051.01

CERTIFICATE OF FIRST CLASS MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail, postage prepaid in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on October 10, 2003.

  
Shirine Darvish

**SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT**  
**UNDER 37 CFR § 1.97 (c)(2)**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Pursuant to 37 C.F.R. § § 1.56 and 1.97(c), the Applicants bring to the attention of the Examiner the documents listed on the attached PTO Form 1449. A copy of each publication is being submitted herewith.

Applicants have listed dates of publication on the attached PTO-1449 for the cited documents based on information presently available to the undersigned. However, the listed publication dates should not be construed that the information in the cited documents was actually published or otherwise publicly available on the date indicated.

COPY

Applicants respectfully request that the Examiner consider the listed documents and indicate that they were considered by making appropriate notations on the attached Form 1449. This submission does not represent that a search has been made or that no better art exists. Nor does it constitute an admission that each or all of the listed documents are material or constitute "prior art." Further, if the Examiner applies any of the documents as prior art against any claim in the application and Applicants determine that the cited documents do not constitute "prior art" under United States law, Applicants reserve the right to present to the Office the relevant facts and law regarding the appropriate status of such documents. Moreover, the Applicants further reserve the right to take appropriate action to establish the patentability of the disclosed invention over the listed documents, should one or more of the documents be applied against the claims of the present application.

Although we believe that we have provided for the fee due in connection with this submission, the Commissioner is authorized to credit any overpayment or charge any deficiencies to/from our **Deposit Account No. 06-1448**.

Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at (617) 832-1000.

Date: October 10, 2003

**Customer No: 25181**  
Patent Group  
Foley Hoag LLP  
155 Seaport Boulevard  
Boston, MA 02210-2600

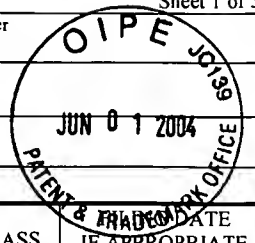
Respectfully Submitted,



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Theresa C. Kavanaugh, Ph.D.  
Reg. No. 50,356  
Agent for Applicants

Form PTO-1449

**INFORMATION DISCLOSURE CITATION  
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(Use several sheets if necessary)
Docket Number (Optional)  
KVC-051.01Application Number  
09/998,944Applicant  
Bennett, S.Filing Date  
October 31, 2001Group Art Unit  
2877
**U.S. PATENT DOCUMENTS**

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	TRADEMARK IF APPROPRIATE

**FOREIGN PATENT DOCUMENTS**

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation	
						YES	NO
	EA	DE 33 05 104 A1	16 Aug 84	German			X
	EB	FR 2 535 463A	18 May 84	France			
	EC	DE 36 15 305 A1	12 Nov. 87	German			X
	ED	DE 37 42 201 A1	22 June 89	Germany	X		
	EE	EP 0 551 874 A2	21 Jul 93	EPO	X		X
	EF	EP 0 586 242 A1	9 Mar. 94	EPO	X		
	EG	JP 07209398	11 Aug 95	Japan			
	EH	EP 0 686 867 A1	13 Dec 95	European Patent Application			
	EI	EP 0 722 081 A2	17 July 96	European Patent Application			
	EJ	EP 856 737 A1	5 Aug. 98	EPO			
	EK	EP 0 871 009 A1	14 Oct. 98	EPO			
	EL	EP 0 872 756 A1	21 Oct. 98	European Patent Application			
	EM	WO98/58268 A	23 Dec 98	PCT (corresponds to 6,023,331)			
	EN	WO00/36425	22 June 00	PCT			
	EO	WO00/31551	2 June 00	PCT			

**OTHER DOCUMENTS**

(Including Author, Title, Date, Pertinent Pages Etc.)

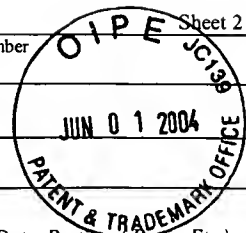
FA	Alekseev et al; " Fiber Optic Gyroscope With Suppression of Excess Noise From the Radiation Source ", Technical Physical Letters , 24(9): 719-721, (September 1998)
FB	Blake et al., "In-Line Sagnac Interferometer Current Sensor," <i>IEEE</i> , pp. 116-121 (1995).

EXAMINER	DATE CONSIDERED
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EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP § 609; Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to the applicant.

Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Form PTO-1449	Docket Number (Optional) KVC-051.01	Application Number 09/998,944
<b>INFORMATION DISCLOSURE CITATION</b> <b>IN AN APPLICATION</b> <i>(Use several sheets if necessary)</i>	Applicant Bennett, S.	
	Filing Date October 31, 2001	Group Art Unit 2877



### OTHER DOCUMENTS

(Including Author, Title, Date, Pertinent Pages Etc.)

FC	Blake and Szafraniec, "Random Noise in PM and Depolarized Fiber Gyros", OSA Symposium Proceedings, 1997, OWB2, pp. 122-125.
FD	Bohnert. et al., "Field Test of Interferometric Optical Fiber High-Voltage and Current Sensors" <i>SPIE</i> , Vol. 2360 pp. 16-19 (Feb. 1994).
FE	Bohnert. et al., "Temperature and Vibration Insensitive Fiber-Optic Current Sensor" <i>ABB</i> , Vol. 2360 pp 336-339 (Feb. 1994).
FF	Burns, et al., "Excess Noise in Fiber Gyroscope Sources", IEEE Photonics Technology Letter, Vol 2, No. 8, August 1990, pp. 606-608.
FG	Clark et al., "Application of a PLL and ALL Noise Reduction Process in Optical Sensing System," <i>IEEE Transactions on Industrial Electronics</i> , Vol. 44, No. 1, February 1997, pp. 136-138
FH	Dagenais et al., "Low-Frequency Intensity Noise Reduction for Fiber-Optic Sensor Applications," <i>Optical Fiber Sensors Conference</i> , 1992, January 29-31, pp. 177-180
FI	Dupraz, J.P., "Fiber-Optic Interferometers for Current Measurement: Principles and Technology", Alsthom Review No. 9: 29-44 (December 1987).
FJ	Frosio, G. and Dändliker, "Reciprocal Reflection Interferometer for a Fiber-Optic Faraday Current Sensor", <i>Applied Optics</i> 33 (25): 6111-6122 (September 1, 1994).
FK	Gronau Yuval et al.; "Digital Signal Processing For An Open-Loop Fiber-Optic Gyroscope", <i>Applied Optics</i> , Optical Society of America, Washington, U.S., vol. 34, no. 25, 1 September 1995, pgs. 5849-5853
FL	Killian M. Kevin; "Pointing Grade Fiber Optic Gyroscope", IEEE AES Systems Magazine, pp. 6-10 (July 1994)
FM	LaViolette and Bossler: "Phase Modulation Control for An Interferometric Fiber Optic Gyroscope", IEEE Plan 90, Position Location and Navigation Symposium, Las Vegas, (March 20-23, 1990)
FN	Lefevre, "The Fiber-Optic Gyroscope", Artech House, Boston, pp. 29-30 (1993)
FO	McCallion and Shimazu; "Side-Polished Fiber Provides Functionality and Transparency", <i>Laser Focus World</i> , 34 (9): S19- S24, ( September 1, 1998)
FP	Moeller and Burns, "1.06µm All-fiber Gyroscope with Noise Subtraction, Proceedings of the Conference on Optical Fiber Sensors", IEEE-OSA, Monterey, CA, 1992, pp. 82-85
FQ	Moeller and Burns, "Observation of Thermal Noise in a Dynamically Biased Fiber-Optic Gyro", <i>Optical Letters</i> , 1996, Vol. 21, pp. 171-173.

EXAMINER	DATE CONSIDERED
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Form PTO-1449

## INFORMATION DISCLOSURE CITATION IN AN APPLICATION

*(Use several sheets if necessary)*

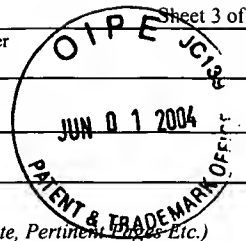
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Application Number  
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Applicant  
Bennett, S.

Filing Date  
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Group Art Unit  
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## OTHER DOCUMENTS

(Including Author, Title, Date, Pertinent Pages Etc.)

	FR	Nikos Drakos, "Circular Polarization States for Light, and Quarter-Wave Plates," <i>Computer Based Learning Unit, University of Leeds</i> (March 2, 1998)
	FS	Ono et al.; " A Small -Sized, Compact, Open-loop Fibre-Optic Gyroscope with Stabilized Scale Factor", Meas. Sci. Technol. 1: 1078-1083, (1990)
	FT	Polynkin et al.; " All-Optical Noise-Subtraction Scheme for a Fiber-Optic Gyroscope", Optics Letters, 25(3): 147-149, (February 1, 2000)
	FU	Rabelo et al.; " SNR Enhancement of Intensity Noise-Limited FOGs", Journal of Lightwave Technology 18(12):2146-2150 (December 2000)
	FV	Short, S. et al., "Elimination of Birefringence Induced Scale Factor Errors in the In-Line Sagnac Interferometer Current Sensor", Journal of Lightwave Technology 16 (10): 1844-1850 (October 1998).
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**U.S. PATENT DOCUMENTS**

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	AAA	4,571,650	2/18/86	Ojima et al.		
	AAB	4,603,931	08/05/86	Ruffman		
	AAC	4,615,582	10/07/86	Lefevre et al.		
	AAD	4,630,229	12/16/86	D'Hondt		
	AAE	4,630,890	12/23/86	Ashkin et al.		
	AAF	4,637,722	1/20/87	Kim		
	AAG	4,668,264	05/26/87	Dyott		
	AAH	4,669,814	06/02/87	Dyott		
	AAI	4,697,876	10/06/87	Dyott		
	AAJ	4,705,399	11/10/87	Graindorge et al.		
	AAK	4,712,866	12/15/87	Dyott		
	AAL	4,733,938	03/29/88	Lefevre et al.		
	AAM	4,740,085	04/26/88	Lim		
	AAN	4,755,021	07/05/88	Dyott		

**FOREIGN PATENT DOCUMENTS**

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation	
						YES	NO
EA	DE 33 05 104 A1	16 Aug 84	German				X
EB	FR 2 535 463A	18 May 84	France				
EC	DE 36 15 305 A1	12 Nov. 87	German				X
ED	DE 37 42 201 A1	22 June 89	Germany	X			
EE	EP 0 551 874 A2	21 Jul 93	EPO	X			X
EF	EP 0 586 242 A1	9 Mar. 94	EPO	X			

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FA	Alekseev et al; "Fiber Optic Gyroscope With Suppression of Excess Noise From the Radiation Source ", Technical Physical Letters , 24(9): 719-721, (September 1998)
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	AAO	4,756,589	01/15/86	Bricheno et al.		
	AAP	4,765,739	08/23/88	Koizumi et al.		
	AAQ	4,776,700	10/11/88	Frigo		
	AAR	4,796,993	01/10/89	Sonobe et al.		
	AAS	4,815,817	03/28/89	Levinson		
	AAT	4,842,409	06/27/89	Arditty et al.		
	AAU	4,842,400	07/18/89	Dupraz		
	AAV	4,883,358	11/28/89	Okada		
	AAW	4,887,900	12/19/89	Hall		
	AAX	4,943,132	07/24/90	Huang		
	AAY	5,033,854	07/23/91	Matthews et al.		
	AAZ	5,048,962	09/17/91	Kurokawa et al.		

**FOREIGN PATENT DOCUMENTS**

	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	Translation	
						YES	NO
	EG	JP 07209398	11 Aug 95	Japan		English Abstract	
	EH	EP 0 686 867 A1	13 Dec 95	European Patent Application			X
	EI	EP 0 722 081 A2	17 July 96	European Patent Application			
	EJ	EP 856 737 A1	5 Aug. 98	EPO			
	EK	EP 0 871 009 A1	14 Oct. 98	EPO			
	EL	EP 0 872 756 A1	21 Oct. 98	European Patent Application			
	EM	WO98/58268 A	23 Dec 98	PCT (corresponds to 6,023,331)			
	EN	WO00/36425	22 June 00	PCT			
	EO	WO00/31551	2 June 00	PCT			

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FB	Blake et al., "In-Line Sagnac Interferometer Current Sensor," <i>IEEE</i> , pp. 116-121 (1995).
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	BA	5,056,919	10/15/91	Arditty et al.		
	BB	5,063,290	11/05/91	Kersey		
	BC	5,074,665	12/24/91	Huang et al.		
	BD	5,080,489	01/14/92	Nishikawa et al.		
	BE	5,096,312	03/17/92	Huang		
	BF	5,106,193	04/21/92	Fesler et al.		
	BG	5,133,600	07/28/92	Schröder		
	BH	5,135,555	08/04/92	Coyle, Jr. et al.		
	BI	5,136,235	08/04/92	Brandle et al.		
	BI	5,289,257	02/22/94	Kurokawa et al.		
	B●	5,289,258	02/22/94	Szafraniec, et al.		
	BP	5,331,404	07/19/94	Moeller et al.		
	BM	5,351,123	09/27/94	Spahlinger		
	BN	5,359,413	10/25/94	Chang et al.		
	BO	5,365,338	11/15/94	Bramson		
	BP	5,406,370	10/10/95	Huang et al.		
	BO	5,412,471	05/02/95	Tada et al.		
	B●	5,457,532	10/10/95	August et al.		
	BS	5,459,575	10/10/95	Malvern		
	BT	5,469,257	11/21/95	Blake et al.		
	BU	5,469,267	11/21/95	Wang		
	BV	5,471,301	11/28/95	Kumagai et al.		

**OTHER DOCUMENTS**

(Including Author, Title, Date, Pertinent Pages Etc.)

EXAMINER	FC	Blake and Szafraniec, "Random Noise in PM and Depolarized Fiber Gyros", OSA Symposium Proceedings, 1997, OWB2, pp. 122-125.
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EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	BW	5,475,772	12/12/95	Hung et al.		
	BX	5,493,396	02/20/96	Sewell		
	BY	5,500,909	03/19/96	Meier		
	BZ	5,500,909	04/02/96	Lau et al.		
	CA	5,513,003	09/03/96	Morgan.		
	CB	5,552,887	09/03/96	Dyott		
	CC	5,559,908	09/24/96	August, et al.		
	CD	5,602,642	02/11/97	Bergh et al.		
	CE	5,644,397	07/01/97	Blake		
	CF	5,654,906	08/05/97	Youngquist		
	CG	5,655,035	08/05/97	Burmenko		
	CH	5,682,241	10/28/97	Mark et al.		
	CI	5,696,858	12/09/97	Blake.		
	CJ	5,701,177	12/23/97	Kumagai et al.		
	CK	5,701,376	12/23/97	Shirasaki		
	CL	5,767,509	06/16/98	Cardova et al.		
	CM	5,781,675	07/14/98	Tseng et al.		
	CN	5,854,864	12/29/98	Knoesen et al.		
	CO	5,898,496	04/27/99	Huang et al.		
	CP	5,946,097	08/31/99	Sanders et al.		
	CQ	5,953,121	09/14/99	Bohnert et al.		

**OTHER DOCUMENTS**

(Including Author, Title, Date, Pertinent Pages Etc.)

FD	Bohnert. et al., "Field Test of Interferometric Optical Fiber High-Voltage and Current Sensors" <i>SPIE</i> , Vol. 2360 pp. 16-19 (Feb. 1994).
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	CR	5,987,195	11/16/99	Blake		
	CS	6,023,331	02/08/00	Blake et al.		
	CT	6,025,915	02/15/00	Michal, et al.		
	CU	6,047,095	04/04/00	Knoesen et al.		
	CV	6,075,915	6/13/00	Koops et al.		
	CW	6,148,131	11/14/00	Geertman		
	CX	6,163,632	12/19/00	Rickman et al.		
	CY	6,185,033	02/06/01	Bosc et al.		
	CZ	6,188,811	02/13/01	Blake		
	DA	6,208,775	03/27/01	Dyott		
	DB	6,233,371	05/15/01	Kim et al.		
	DC	6,301,400	10/09/01	Sanders		
	DD	6,307,632	10/23/01	Blake		
	DE	6,351,310	02/26/02	Emge et al.		
	DF	6,356,351	03/12/02	Blake		
	DG	6,370,289	04/09/02	Bennett		
	DH	6,389,185	01/08/01	Meise et al.		
	DI	6,396,965	11/22/00	Anderson		
	DJ	6,434,285	08/13/02	Blake et al.		
	DK	6,535,654	03/18/03	Goettsche et al.		

**OTHER DOCUMENTS**

(Including Author, Title, Date, Pertinent Pages Etc.)

	FE	Bohnert. et al., "Temperature and Vibration Insensitive Fiber-Optic Current Sensor" <i>ABB</i> , Vol. 2360 pp 336-339 (Feb. 1994).
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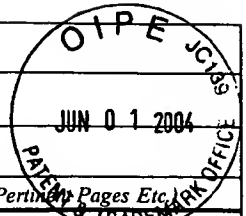
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**INFORMATION DISCLOSURE CITATION  
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KVC-051.01Application Number  
09/998,944Applicant  
Bennett, S.Filing Date  
October 31, 2001Group Art Unit  
2877

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**OTHER DOCUMENTS**

(Including Author, Title, Date, Period, Pages Etc.)

FF	Burns, et al., "Excess Noise in Fiber Gyroscope Sources", IEEE Photonics Technology Letter, Vol 2, No. 8, August 1990, pp. 606-608.
FG	Clark et al., "Application of a PLL and ALL Noise Reduction Process in Optical Sensing System," IEEE Transactions on Industrial Electronics, Vol. 44, No. 1, February 1997, pp. 136-138
FH	Dagenais et al., "Low-Frequency Intensity Noise Reduction for Fiber-Optic Sensor Applications," Optical Fiber Sensors Conference, 1992, January 29-31, pp. 177-180
FI	Dupraz, J.P., "Fiber-Optic Interferometers for Current Measurement: Principles and Technology", Alsthom Review No. 9: 29-44 (December 1987).
FJ	Frosio, G. and Dändliker, "Reciprocal Reflection Interferometer for a Fiber-Optic Faraday Current Sensor", Applied Optics 33 (25): 6111-6122 (September 1, 1994).
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FO	McCallion and Shimazu; "Side-Polished Fiber Provides Functionality and Transparency", Laser Focus World, 34 (9): S19-S24, (September 1, 1998)
FP	Moeller and Burns, "1.06µm All-fiber Gyroscope with Noise Subtraction, Proceedings of the Conference on Optical Fiber Sensors", IEEE-OSA, Monterey, CA, 1992, pp. 82-85
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